

## Stroke in Young Adults: An Indian Perspective

Population-based studies are essential to determine the incidence, prevalence, etiologies, management trends, and prognosis of any disease in the population. Robust data on these epidemiologic aspects are crucial in planning the allocation of healthcare resources for primary and secondary prevention strategies. Population-based registries are designed to study the incidence of disease and collect data on a cohort of patients, usually from a specific geographic area and attempt to get near-complete capture of data from a particular region.

India is a diverse country with varying levels of uptake of modern medical care. As a result, many patients with transient ischemic attacks and minor strokes are misdiagnosed, underdiagnosed and undertreated.<sup>[1]</sup> This carries the risk of missing data on stroke. Patients dying before reaching the hospital are also likely to be missed unless death registration is complete in the study area. Stroke-in-young demands a focused and sometimes extensive investigative work up to diagnose the underlying cause. At times, these may be out of reach for most patients in the rural parts of the country with inadequate access to advanced health care.

This issue of the journal features the results from a registry-based study on stroke epidemiology from the Indian city of Ludhiana.<sup>[2]</sup>

This epidemiological study gives information about strokes-in-young and their etiologies and compares them with stroke in older adults. The authors have tried to include all patients who developed stroke in a defined geographic location; however, the Indian scenario presents formidable challenges in case ascertainment. Several factors pose a challenge: multiplicity of care providers, including traditional practitioners, outmigration of patients to nearby hospitals, non-cooperation of private providers and hospitals, lack of proper death registrations, etc., There is no mechanism to cross-check if all strokes were indeed captured. These lead to several inaccuracies in estimating the various parameters. Since the authors have used the WHO clinical definition of stroke, various practitioners from hospitals or physiotherapy units with varying expertise would have varying sensitivity and specificity to diagnose strokes. This could lead to inaccuracies in the estimation of the numerator. The study data was collected from March 2011 to March 2013. The denominator in assessing the incidence of stroke in young is the total population at risk. We also do not know if this figure was derived from the 2011 census of this district and whether the population at risk was derived, taking into account people who would enter and exit this age bracket of 18 – 49 over this time frame. This could have led to inaccuracy in estimating the denominator. Missed death registrations could have led to an underestimation of the mortality rates. Etiologic classification and stroke subtyping are dependent on investigation intensity. Lack of

uniform application of investigations is associated with major misclassification. For example, results of echocardiography to diagnose rheumatic heart disease might not have been available in those patients whose data were obtained from municipal records. How many underwent echocardiography to diagnose occult cardiac disease, angiography to look for significant carotid stenosis, dissections, and other investigations such as electrophoresis to look for hemoglobinopathies is also unclear. This leads to significant heterogeneity in the identification and subtyping of the stroke. The causes of stroke-in-young such as arterial dissections, vasculitides, moyamoya disease, patent foramen ovals, hemoglobinopathies, are conspicuously absent in this cohort. The operational definitions for the risk factors have not been mentioned. There is limited data on the outcome of transient ischemic attacks in our country. This study has excluded TIAs. They had probably also excluded subarachnoid hemorrhages.

The authors found an incidence rate of 46 strokes per 100,000 people in the 19-49 age group. These rates are higher as compared to the western population. In a meta-analysis by Marini *et al.*,<sup>[3]</sup> the age and sex-adjusted incidence rate was 8.6-19.1 per 100,000 population in Europe and the Americas. However, we do not have the incidence rates for Ludhiana standardized to the world population. More than 60% of the patients were employed and were earning members. In this cohort of patients, 40% had a poor outcome and were functionally dependent four weeks after the stroke. The authors report a case fatality rate of 18% in this cohort. To put this in perspective, the pooled one-month case fatality rate in ischemic strokes was 13.5% in a meta-analysis by Zhang *et al.*<sup>[4]</sup> However, in a study from the Netherlands,<sup>[5]</sup> 30 day mortality was 23% in patients with young stroke aged between 18 and 49 years. The authors aimed to present a figure suitable for comparison with other studies; however, it is difficult to compare without standardization of the estimates. However, the unstandardized estimates of stroke incidence appear to be higher than the western estimates. Since stroke in young adults leads to devastating consequences for the patient and family in terms of quality of life and financial burden, these numbers are alarming.

The authors have compared the data of young patients with stroke with those of older adults. As expected, the outcomes in younger patients were better, with 60% being functionally independent at 28 days as compared to 46% attaining similar outcomes amongst older adults.

In this cohort, almost three-fourths of patients were hypertensive and a quarter was diabetic. This pattern is very similar to the conventional risk factors for stroke seen in older adults. This could suggest that, contrary to popular belief, conventional risk factors are still the commonest identifiable risk factor for

stroke in young in India. In younger adults, attempts should be made to identify the etiology of hypertension. In this cohort, it is not known if increased blood pressure in this cohort is due to secondary causes or due to essential hypertension. Importantly, these conventional risk factors are easily amenable to treatment.<sup>[6]</sup> So, it is likely that by aggressive screening and treatment of these diseases, it is possible to bring down the incidence of stroke and other vascular complications like myocardial infarction and cognitive impairment. This study could serve as a reminder to the public health authorities regarding the importance of screening for and treating these non-communicable diseases. Similarly, the use of tobacco and recreational drugs was also found in a significant number of young adults and suggests the need for education and regulatory measures to curb the use of these products.

This study also shows findings that are different from the profile of stroke in the young in the western population. The outcomes in stroke have improved significantly due to acute stroke intervention and also due to access to appropriate diagnosis and rehabilitation.<sup>[7]</sup> However, in India, the long-term outcomes of stroke are unknown.<sup>[8]</sup> This highlights the importance of stroke registries and following up these cohorts of patients. Future studies should take these factors into account to provide more accurate data that is representative of our Indian population.

The registries should follow standard case definitions and capture the data from various parts of the country. We also lack data on the incidence of subarachnoid hemorrhage, stroke subtypes, imaging features, vascular pathologies, and genomics, though certain cohorts have started collecting these data.<sup>[9]</sup> For a country to invest its money and manpower in maintaining disease registries, it is essential to plan how the data will be put into use. The availability of electronic databases and ease of internet access have opened portals to even the country's most rural areas.<sup>[10]</sup> Policymakers should pay attention to data security and equitable access of these resources to everyone. The assessment of the burden of stroke in the young population and public health measures for primary and secondary prevention seems to be very much possible in the near future. Existing tertiary care hospital networks and primary care should get integrated into this large database which could be the game-changer for Indian health care in the coming years. Follow-up of these cohorts can give us valuable data in the allocation of resources.

In summary, while such population-based studies are important, certain limitations of our settings and health care

system increase the risk of under or overestimating incidence or case fatality. Nevertheless, future studies may be designed to overcome these limitations because Inaccurate estimates may do more harm to public health than an informed guesstimate.

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